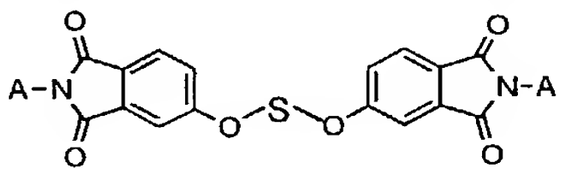
Claims

[c1] 1.A method for the synthesis of an activated bisimide, comprising

reacting 4-halotetrahydrophthalic anhydride with a primary amine having the formula A-NH_2 to yield an N-substituted-4-halotetrahydrophthalimide wherein A is a group which activates the tetrahydrophthalimide ring system to aromatization;

aromatizing activated 4-halotetrahydrophthalimide in the presence of a catalyst to yield an activated 4-halophthalimide; and

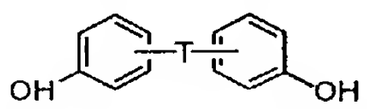
treating activated 4-halophthalimide (V) with a disodium salt of a dihydroxy compound having the structure HO-S-OH, to yield the activated bisimide (VI):



(VI)

[c2] 2.The method of claim 1, wherein S is selected from the group consisting of a straight or branched chain alkylene group having from about 2 to about 20 carbon atoms, a cycloalkylene group having from about 3 to about 20 carbon atoms, an arylene group having from 6 to about 20 carbon atoms, halogenated derivatives of arylene groups having from about 6 to 20 carbons.

[c3] 3.The method of claim 1, wherein the dihydroxy compound is a bis(phenol) having the formula (XIII):



(XIII)

wherein T is selected from the group consisting of a single bond linking the two aryl groups, a straight or branched chain alkylene group having from about 2 to about 20 carbon atoms, a cycloalkylene group having from about 3 to about 20 carbon atoms; an arylene group having from 6 to about 20 carbon atoms, sulfide, carbonyl, sulfoxide, ether and mixtures thereof.

[c4] 4.The method of claim 3, wherein T is selected from the group consisting of 2,2-bis[4-hydroxyphenyl]propane; 4,4'-bis(4-hydroxyphenyl)diphenyl ether; 4,4'-bis(4-phenoxy)diphenyl sulfide; 4,4'-bis(4-hydroxyphenyl)benzophenone; 4,4'-bis(4-hydroxyphenyl)diphenyl sulfone; 2,2-bis[4-(3-hydroxyphenyl) phenyl]propane; 4,4'-bis(3-hydroxyphenyl)diphenyl ether; 4,4'-bis(3-hydroxyphenyl)diphenyl sulfide; 4,4'-bis(3-hydroxyphenyl)benzophenone; 4,4'-

bis(3-hydroxyphenyl)diphenyl sulfone; 4-(3-hydroxyphenyl)-4'-(4-hydroxyphenyl)diphenyl-2,2-propane; 4-(3-hydroxyphenyl)-4'-(4-hydroxyphenyl)diphenyl ether; 4-(3-hydroxyphenyl)-4'-(4-hydroxyphenyl) diphenyl sulfide; 4-(3-hydroxyphenyl)-4'-(4-hydroxyphenyl)benzophenone, and 4-(hydroxyphenyl)-4'-(4-hydroxyphenyl)diphenyl sulfone dianhydride, and mixtures thereof.

[c5] 5.The method of claim 3, wherein the dihydroxy compound is bisphenol A.

[c6] 6.The method of claim 1, wherein A is selected from the group consisting of pyridine, chloropyridine, nitropyridine, pyrimidine, pyrazine, thiazole, methylthiazole, benzothiazole, 1,3,4-thiadiazole, and benzotriflouride.

[c7] 7.The method of Claim 1, wherein A is 2-pyridyl.

[c8] 8.The method of claim 1, wherein the catalyst is copper based.

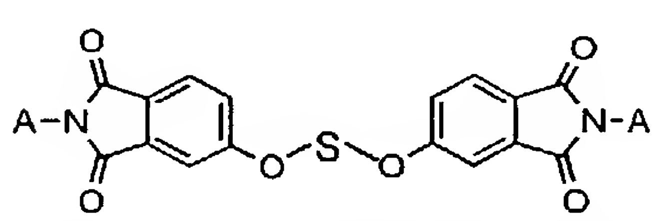
[c9] 9.The method of claim 8, wherein the catalyst further comprises activated carbon.

[c10] 10.A method for the synthesis of poly(etherimide)s, comprising

reacting 4-halotetrahydrophthalic anhydride with a primary amine having the formula A-NH_2 to yield an N-substituted-4-halotetrahydrophthalimide wherein A is a group which activates the tetrahydrophthalimide ring system to aromatization;

aromatizing N-substituted-4-halotetrahydrophthalimide in the presence of a catalyst to yield an N-substituted-4-halophthalimide; and

treating N-substituted-4-halophthalimide with a disodium salt of a dihydroxy compound having the structure HO-S-OH, to yield the activated bisimide (VI); and



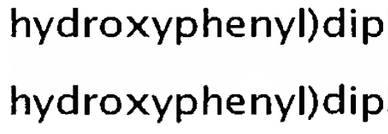
(XII)

reacting activated bisimide (XII) with a diamine to form a poly(etherimide) and the primary alnine.

[c11] 11.The method of claim 10, wherein S is selected from the group consisting of a

straight or branched chain alkylene group having from about 2 to about 20 carbon atoms, a cycloalkylene group having from about 3 to about 20 carbon atoms, an arylene group having from 6 to about 20 carbon atoms, halogenated derivatives of arylene groups having from about 6 to 20 carbons.

[c12] 12.The method of claim 11, wherein the dihydroxy compound is a bis(phenol) having the formula (XIII):



(XIII)

wherein T is selected from the group consisting of a single bond linking the two aryl groups, a straight or branched chain alkylene group having from about 2 to about 20 carbon atoms, a cycloalkylene group having from about 3 to about 20 carbon atoms; an arylene group having from 6 to about 20 carbon atoms, sulfide, carbonyl, sulfoxide, ether and mixtures thereof.

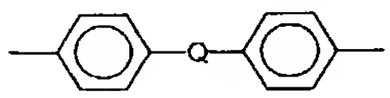
[c13] 13.The method of claim 12, wherein the T is selected from the group consisting of 2,2-bis[4-hydroxyphenyl]propane; 4,4'-bis(4-hydroxyphenyl)diphenyl ether; 4,4'-bis(4-phenoxy)diphenyl sulfide; 4,4'-bis(4-hydroxyphenyl)benzophenone; 4,4'-bis(4-hydroxyphenyl)diphenyl sulfone; 2,2-bis[4-(3-hydroxyphenyl) phenyl]propane; 4,4'-bis(3-hydroxyphenyl)diphenyl ether; 4,4'-bis(3-hydroxyphenyl)diphenyl sulfide; 4,4'-bis(3-hydroxyphenyl)benzophenone; 4,4'-bis(3-hydroxyphenyl)diphenyl sulfone; 4-(3-hydroxyphenyl)-4'-(4-hydroxyphenyl)diphenyl-2,2-propane; 4-(3-hydroxyphenyl)-4'-(4-hydroxyphenyl)diphenyl ether; 4-(3-hydroxyphenyl)-4'-(4-hydroxyphenyl) diphenyl sulfide; 4-(3-hydroxyphenyl)-4'-(4-hydroxyphenyl)benzophenone, and 4-(hydroxyphenyl)-4'-(4-hydroxyphenyl)diphenyl sulfone dianhydride, and mixtures thereof.

[c14] 14.The method of claim 10, wherein A is selected from the group consisting of pyridine, chloropyridine, nitropyridine, pyrimidine, pyrazine, thiazole, methylthiazole, benzothiazole, 1,3,4-thiadiazole, and benzotriflouride.

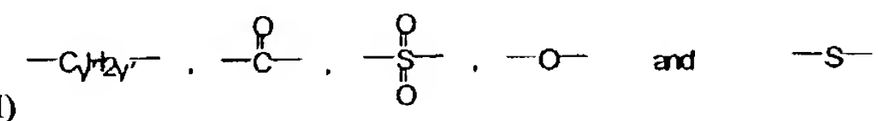
[c15] 15.The method of Claim 10, wherein A is 2-pyridyl.

[c16] 16.The method of claim 10, wherein the diamine has the structure $H_2N-Z-NH_2$, wherein Z is selected from the group consisting of a straight or branched

chain alkylene group having from about 2 to about 20 carbon atoms, a cycloalkylene group having from about 3 to about 20 carbon atoms, an arylene group having from 6 to about 20 carbon atoms, halogenated derivatives of an arylene group having from 6 to about 20 carbon atoms, and diarylene radicals of the following general formula (XV):

(XV) 

wherein Q includes, but is not limited to, the formula (XVI):

(XVI) 

wherein y is an integer from about 1 to about 5, methylene, ethylene, propylene, isopropylene, n-butylene, 1,3-phenylene, naphthylene, and mixtures thereof.

[c17] 17.The method of claim 10, wherein the catalyst is copper based.

[c18] 18.The method of claim 17, wherein the catalyst further comprises activated carbon.

[c19] 19.The method of claim 10 further comprising recycling the primary amine.

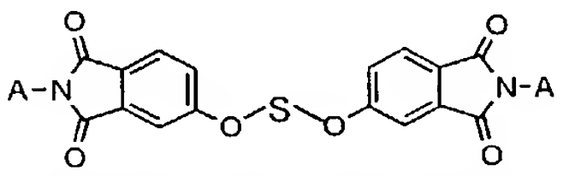
[c20]

20.A method for the synthesis of poly(etherimide)s, comprising

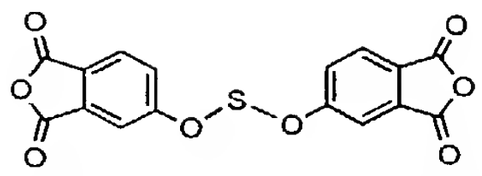
reacting 4-halotetrahydrophthalic anhydride with a primary amine having the formula $A-NH_2$ to yield an N-substituted-4-halotetrahydrophthalimide wherein A is a group which activates the tetrahydrophthalimide ring system to aromatization;

aromatizing the N-substituted-4-halotetrahydrophthalimide in the presence of a catalyst to yield an N-substituted-4-halophthalimide; and

treating N-substituted-4-halophthalimide with a disodium salt of a dihydroxy compound having the structure HO-S-OH, to yield the activated bisimide (VI); and

 (VI)

converting the activated bisimide (VI) to dianhydride (VIII)

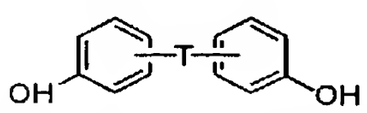


(VIII)

and reacting dianhydride (VIII) with a diamine to yield a poly(etherimide).

[c21] 21.The method of claim 20, wherein S is selected from the group consisting of a straight or branched chain alkylene group having from about 2 to about 20 carbon atoms, a cycloalkylene group having from about 3 to about 20 carbon atoms, an arylene group having from 6 to about 20 carbon atoms, halogenated derivatives of arylene groups having from about 6 to 20 carbons.

[c22] 22.The method of claim 20, wherein the dihydroxy compound is a bis(phenol) having the formula (XIII):



(XIII)

wherein T is selected from the group consisting of a single bond linking the two aryl groups, a straight or branched chain alkylene group having from about 2 to about 20 carbon atoms, a cycloalkylene group having from about 3 to about 20 carbon atoms; an arylene group having from 6 to about 20 carbon atoms, sulfide, carbonyl, sulfoxide, ether and mixtures thereof.

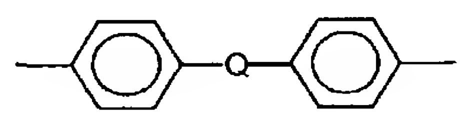
[c23] 23.The method of claim 22, wherein T is selected from the group consisting of 2,2-bis[4-hydroxyphenyl]propane; 4,4'-bis(4-hydroxyphenyl)diphenyl ether; 4,4'-bis(4-phenoxy)diphenyl sulfide; 4,4'-bis(4-hydroxyphenyl)benzophenone; 4,4'-bis(4-hydroxyphenyl)diphenyl sulfone; 2,2-bis[4-(3-hydroxyphenyl) phenyl]propane; 4,4'-bis(3-hydroxyphenyl)diphenyl ether; 4,4'-bis(3-hydroxyphenyl)diphenyl sulfide; 4,4'-bis(3-hydroxyphenyl)benzophenone; 4,4'-bis(3-hydroxyphenyl)diphenyl sulfone; 4-(3-hydroxyphenyl)-4'-(4-hydroxyphenyl)diphenyl-2,2-propane; 4-(3-hydroxyphenyl)-4'-(4-hydroxyphenyl)diphenyl ether; 4-(3-hydroxyphenyl)-4'-(4-hydroxyphenyl) diphenyl sulfide; 4-(3-hydroxyphenyl)-4'-(4-hydroxyphenyl)benzophenone, and 4-(hydroxyphenyl)-4'-(4-hydroxyphenyl)diphenyl sulfone dianhydride, and mixtures thereof.

[c24] 24.The method of claim 20, wherein A is selected from the group consisting of pyridine, chloropyridine, nitropyridine, pyrimidine, pyrazine, thiazole,

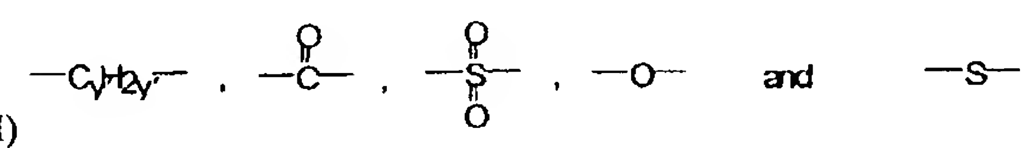
methylthiazole, benzothiazole, 1,3,4-thiadiazole, and benzotriflouride.

[c25] 25.The method of Claim 20, wherein A is 2-pyridyl.

[c26] 26.The method of claim 20, wherein the diamine has the structure $H_2N-Z-NH_2$, wherein Z is selected from the group consisting of a straight or branched chain alkylene group having from about 2 to about 20 carbon atoms, a cycloalkylene group having from about 3 to about 20 carbon atoms, an arylene group having from 6 to about 20 carbon atoms, halogenated derivatives of an arylene group having from 6 to about 20 carbon atoms, and diarylene radicals of the following general formula (XV):

(XV) 

wherein Q includes, but is not limited to, the formula (XVI):

(XVI) 

wherein y is an integer from about 1 to about 5, methylene, ethylene, propylene, isopropylene, n-butylene, 1,3-phenylene, naphthylene, and mixtures thereof.

[c27] 27.The method of Claim 20, wherein the activated bisimide (VI) is converted to dianhydride (VIII) by reacting the activated bisimide with phthalic anhydride.

[c28] 28.The method of Claim 20, wherein the activated bisimide (VI) is converted to dianhydride (VIII) by hydrolysis ring closure.

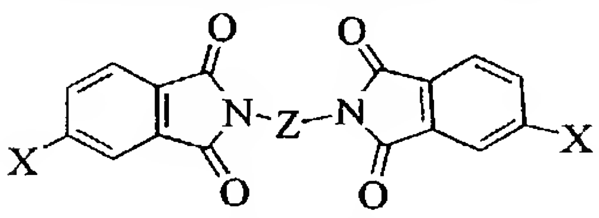
[c29] 29.The method of claim 20, wherein the catalyst is copper based.

[c30] 30. The method of claim 29, wherein the catalyst further comprises activated carbon.

[c31]

31.A method for the synthesis of poly(etherimide)s, comprising reacting 4-halotetrahydrophthalic anhydride with a primary amine having the formula $A-NH_2$ to yield an N-substituted-4-halotetrahydrophthalimide wherein A is a group which activates the tetrahydrophthalimide ring system to aromatization;

aromatizing N-substituted-4-halotetrahydrophthalimide in the presence of a catalyst to yield an N-substituted-4-halophthalimide in the presence of a catalyst;
treating N-substituted-4-halophthalimide (V) diamine (VII) to produce the dihalobisimide (IX); and



(IX)

reacting dihalobisimide (IX) with the disodium salt of a dihydroxy compound having the structure HO-S-OH, to yield poly(etherimide).

[c32] 32.The method of claim 31, wherein the catalyst is copper based.

[c33] 33.The method of claim 32, wherein the catalyst further comprises activated carbon.

[c34] 34.The method of claim 31, wherein A is selected from the group consisting of pyridine, chloropyridine, nitropyridine, pyrimidine, pyrazine, thiazole, methylthiazole, benzothiazole, 1,3,4-thiadiazole, and benzotrifloride.

[c35] 35.The method of claim 34, wherein A is 2-pyridyl.

[c36] 36.The method of cliam 31, wherein the dihydroxy compond is bisphenol A.

[c37] 37.A method for the synthesis of an activated 4-halophthalimide, comprising reacting 4-halotetrahydrophthalic anhydride with a primary amine having the formula $A-NH_2$ to yield an N-substituted-4-halotetrahydrophthalimide wherein A is a group which activates the tetrahydrophthalimide ring system to aromatization; and
aromatizing activated 4-halotetrahydrophthalimide in the presence of a catalyst to yield an activated 4-halophthalimide.

[c38] 38.The method of claim 37, wherein the catalyst is copper based.

[c39] 39.The method of claim 38, wherein the catalyst further comprises activated carbon.

[c40] 40.The method of claim 37, wherein A is selected from the group consisting of

pyridine, chloropyridine, nitropyridine, pyrimidine, pyrazine, thiazole, methylthiazole, benzothiazole, 1,3,4-thiadiazole, and benzotriflouride.

[c41] 41.The method of claim 40, wherein A is 2-pyridyl.